The Effects of Graphene on Microstructural and Thermal Properties of Calcium Chloride Hexahydrate PCM

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ABSTRACT

Phase change materials (PCMs) are the excellent option used to store thermal energy as latent heat which substantially contribute to the efficient use and conservation of waste heat and solar energy. There are very few studies on nano enhanced inorganic PCM especially calcium chloride hexahydrate. Therefore, the aim of this paper is to examine the effects of graphene on the microstructural and thermal properties of calcium chloride hexahydrate. The thermal conductivity and morphology of pure PCM and nanoenhanced graphene PCM was investigated using Field emission scanning electron microscope (FESEM), Transmission electron microscope (TEM), 3D Laser microscope (LEXT), KD2 Pro thermal property analyser and Differential scanning calorimeter (DSC) methods. From the microstructural observation, a sharp single lattice fringe proved that graphene has uniformly dispersed with PCM and removed the stacking effect and agglomeration. The thermal conductivity and increased by 20% when 2wt% of graphene were mixed with calcium chloride hexahydrate. This nanoenhanced PCM is suitable for energy storage in solar thermal and photovoltaic thermal applications.

KEYWORDS

Phase change materials, Graphene, Conductivity, Thermal conductivity, Calcium, Nanoparticles, Temperature measurement

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